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APPLICATION FOR UNITED STATES LETTERS PATENT

FOR

APPARATUS AND METHOD FOR SEALING A VERTICAL PROTRUSION ON A ROOF

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Inventor: Steven Mayle

Attorneys: Standley & Gilcrest, L.L.P.  
Attn.: Jeffrey S. Standley  
495 Metro Place South  
Suite 210  
Dublin, Ohio 43017-5315  
Telephone: (614) 792-5555  
Facsimile: (614) 792-5536

## TITLE OF THE INVENTION

### APPARATUS AND METHOD FOR SEALING A VERTICAL PROTRUSION ON A ROOF

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Inventor: Steven Mayle

## BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to roof-covering devices, and more particularly to a boot for covering and providing a water-tight seal around a protrusion on a roof.

Polymer coated membranes are commonly used to cover roofs. Often, the membrane is custom designed for the particular roof on which it is used. The roof measurements are provided to the factory which creates a unitary membrane from separate pieces which have been heat welded together.

Although these roofs are generally flat, there are frequently items protruding from the surface of the roof, such as vents, ductwork, air conditioning units, and the like. The size of these items should be provided to the factory so that accommodations can be made for them in the membrane. Locations of these items may also be provided to the factory where the cuts are made at the factory (e.g., not in the field).

The present invention specifically relates to a boot for covering and sealing a vertical protrusion (e.g., pipe) extending from a roof to be sealed. As discussed, when installing a roof membrane, it is desirable to provide a water-tight seal around protrusions in a roof. When installing a boot around a protruding pipe, generally three seals must be made to provide a water-tight seal around the pipe:

- 1.) a base portion of the boot should be sealed to a vertical portion of the boot (e.g. heat sealed);

- 2.) the base portion should be sealed to the roof or a roof membrane(e.g. heat sealed); and
- 3.) a top portion of the vertical portion of the boot should be sealed around the pipe to prevent water from entering any space between the boot and the pipe.

Currently this process of sealing a protruding pipe takes a relatively long time and often results in a poor seal. Accordingly, the present invention relates to a new method and apparatus for sealing vertical protrusions from a roof allowing the boot of the present invention to be easily installed and adjusted to provide a tight seal for protruding pipes of various diameters.

The boot of the present invention:

- 1.) allows easier and more cost-effective installation;
- 2.) allows sealing of pipes of various diameters; and
- 3.) provides tight seals to pipes of various diameters.

In addition to the features mentioned above, objects and advantages of the present invention will be readily apparent upon a reading of the following description.

The boot of the present invention is comprised of:

a base portion having an opening; a top portion attached to the base portion along the opening in the base portion; a break in the base portion and the top portion, the break in the base portion separating a first portion of the base portion from a second portion of the base portion, and wherein the break in the top portion separates a first portion of the top portion from a second portion of the top portion; and wherein the break allows the apparatus to be opened to accept a protrusion on the roof to be covered and wherein the first portions of the base portion and the top portion may be pulled around the protrusion and sealed to the second portions of the base portion and top portion, respectively. The first portions of the base portion and top

portion may be adjustably pulled around the protrusion to accommodate protrusions of various sizes.

### BRIEF DESCRIPTION OF THE DRAWINGS

Novel features and advantages of the present invention, in addition to those mentioned above, will become apparent to those skilled in the art from a reading of the following detailed description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

**Figure 1** illustrates one embodiment of a cut-out piece for an open boot embodiment;

**Figure 2** illustrates one embodiment of a top portion of a boot;

**Figure 3** illustrates a base portion of a boot engaged to a bottom die piece;

**Figure 4** illustrates the top portion of **Figure 2** surrounded by a top die piece;

**Figure 5** illustrates the top die piece of **Figure 4** assembled with the bottom die piece of

**Figure 3;**

**Figure 6** illustrates one embodiment of an open boot of the present invention; and

**Figure 7** illustrates another embodiment of an open boot of the present invention.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENT(S)

The preferred system herein described is not intended to be exhaustive or to limit the invention to the precise forms disclosed. They are chosen and described to explain the principles of the invention, and the application of the method to practical uses, so that others skilled in the art may practice the invention.

The boot (or flashing) of the present invention is an open design. In other words, there is a slit or cut **54** in the top (or vertical) portion **50** of the boot. The base portion **52** of the boot is

also cut **56** (slit **56** meets the slit **54** in the top portion) so that the boot may be opened to accept an existing vertical protrusion on the roof.

As illustrated in **Figure 6**, the gap or divide **60, 61** in the boot separates the joint portions **A, B, C, D** of the boot. The break **60** in the base portion separates a first portion **A** of the base portion from a second portion **B** of the base portion. The break **61** in the top portion separates a first portion **C** of the top portion from a second portion **D** of the top portion.

A protrusion on the roof to be sealed is placed in the boot through the gap. As an initial step in sealing around the protrusion, the joint portion **A** is joined with joint portion **B** of the base. Joint portion **C** is joined with joint portion **D**.

The break **60, 61** in the boot allows the apparatus to be opened to accept a protrusion on the roof to be covered. The first portions **A, C** of the base portion and the top portion may be pulled around the protrusion and sealed to the second portions **B, D** of the base portion and top portion, respectively. In the preferred embodiment, the break **60** in the base portion is aligned with the break **61** in the top portion.

The boot also has a base flap (**BF**) **58** which is used to seal together base portions **A** and **B**. In one embodiment, the base flap is part of the overlap portion **66** (a more detailed description of the overlap portion is found below) that is used to bond or weld the two joint portions **A** and **B** together. In an alternative embodiment, the base flap is connected to another portion of the boot (e.g., base or non-overlapping portion). It is appreciated that there may be different size stacks for the various size pipes.

**Figure 1** illustrates the cut-out flashing **70** that is formed into the top portion of the flashing. The cut-out is then formed into the top portion illustrated in **Figure 2**. The top portion is welded together (at **65**) with an overlapping portion **66** that extends past the weld. As

discussed above, the base flap is preferably an extension of the overlapping portion. The base flap portion preferably extends from a bottom edge 55 of the top portion. In the assembled but uninstalled state (**Figure 6 and 7**), the base flap portion is preferably interposed between the first portion **A** of the base portion and the second portion **B** of the base portion.

5 The base of the flashing is then prepared by fitting the opening 72 in the base onto a bottom die 74. A portion of the base portion around the base opening, illustrated at 80, is fit around the die head 78 for welding to the top portion. See **Figure 3**. The top portion of the flashing is then enclosed by a top die 82. See **Figure 4**. The top die has a base flap slit 84 for engaging the base flap. The base flap is threaded through the slit and away from the weld  
10 juncture between the top portion and the base portion to ensure that the base flap does not get welded to other portions of the flashing. The top die also has a member 86.

The top die is then fitted onto the head of the bottom die so that the top portion is joined with the base portion, more particularly section 80 of the base portion. The top portion is then welded to the base portion.

15 A slit is then made in the base portion and top portion so that a gap or break is formed between portions **A** and **B** and portions **C** and **D**. In one embodiment, the slit is made along the vertical axis 88 along the weld portion 65 of the top portion of the flashing. It is appreciated that in an alternative method of manufacture, the gap between the joint portions may be pre-formed (i.e., without requiring a cut to be made after the welding of the top and base portions of  
20 the flashings).

**Figures 6 and 7** illustrate flashings of the present invention for sealing protrusions (e.g., vertical) of a roof. As illustrated in **Figure 6**, in one embodiment, joint portion **A** was integral with joint portion **B** prior to being cut. During installation around a roof protrusion, the joint

portion **A** is pulled toward the joint portion **B**. The base flap portion is then placed over, and welded to, the first portion **A** of the base portion and the second portion **B** of the base portion.

The open embodiment of the protrusion covering is preferably made by:

a.) preparing a cut-out (**Figure 1**) having a first side edge **90** and a second side edge **92**,

5 the cut-out having a base flap portion extending from a bottom edge **55** along the first side edge;

b.) forming a top portion (**Figure 2**) of the apparatus by overlapping a first portion **94** of the cut-out along the first side edge with a second portion **96** of the cut-out along the second side edge. The base flap portion preferably extends from the overlap portion **66**;

c.) welding the first portion **94** with the second portion **96** at **65**;

10 d.) sealing the top portion of the apparatus with a base portion except for the base flap portion (**Figure 5**);

e.) cutting the base portion and top portion along the axis of the second edge of the top portion creating an opening in the apparatus for accepting a protrusion to be covered.

15 Having shown and described a preferred embodiment of the invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention and still be within the scope of the claimed invention. Thus, many of the elements indicated above may be altered or replaced by different elements which will provide the same result and fall within the spirit of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.